

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	: O'BRIEN, ET AL.	
Appln. No.	: 10/817,651	
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Title	: AQUEOUS DISPERSIONS AND COATINGS	Examiner: Egwim, Kelechi Chidi
Docket No.	: 06-1672-0101	

**AMENDMENT**

Mail Stop Amendment  
Commissioner For Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**FILED VIA EFS-WEB**

First Named Inventor: Robert M. O'Brien

Application No.: 10/871,651

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### **INTRODUCTION**

This Amendment is in response to the Office Action mailed on June 30, 2006.

Please amend the above-identified application as follows:

**AMENDMENTS TO THE CLAIMS**

Please cancel claims 28-35, 38 and 39 such that the status of the claims is as follows:

1. (original) A method, comprising:  
providing an oxirane-functional vinyl addition polymer having an oxirane functionality of 0.5 to 5;  
providing an acid-functional polymer having an acid number of 30 to 500;  
reacting the oxirane-functional vinyl addition polymer and the acid-functional polymer together in the presence of a tertiary amine to form a water-dispersible polymer; and  
dispersing the water-dispersible polymer in a carrier comprising water.
2. (original) The method of claim 1, wherein the water-dispersible polymer is substantially free of mobile BPA and aromatic glycidyl ether compounds.
3. (original) The method of claim 1, wherein the water-dispersible polymer is essentially free of BPA and aromatic glycidyl ether compounds.
4. (original) The method of claim 1, wherein the water-dispersible polymer is completely free of BPA and aromatic glycidyl ether compounds.
5. (original) The method of claim 1, wherein the oxirane-functional vinyl addition polymer is formed by reacting one or more oxirane-functional monomers with one or more other monomers.
6. (original) The method of claim 1, wherein the oxirane-functional vinyl addition polymer is formed by reacting one or more oxirane-functional monomers with one or more other monomers in a carrier.

7. (original) The method of claim 5, wherein the oxirane-functional monomer is a glycidyl ester of an alpha, beta-unsaturated acid, or anhydride thereof.
8. (original) The method of claim 5, wherein the oxirane-functional monomer is selected from the group consisting of glycidyl (meth)acrylate, mono- and di-glycidyl itaconate, mono- and di-glycidyl maleate, and mono- and di-glycidyl formate, and mixtures thereof.
9. (original) The method of claim 1, wherein the oxirane-functional vinyl addition polymer is formed by reacting a copolymer of an alpha, beta-unsaturated acid and an alkyl (meth)acrylate with a glycidyl halide or tosylate to position pendant glycidyl groups on the acrylate copolymer.
10. (original) The method of claim 1, wherein the oxirane-functional vinyl addition polymer has an oxirane functionality of 0.9 to 3.
11. (original) The method of claim 1, wherein the oxirane-functional vinyl addition polymer has a number average molecular weight of 2,500 to 20,000.
12. (original) The method of claim 5, wherein the one or more other monomers are selected from the group consisting of alkyl (meth)acrylate and vinyl monomers.
13. (original) The method of claim 5, wherein the one or more other monomers comprises a vinyl monomer selected from the group consisting of styrene, halostyrene, isoprene, diallylphthalate, divinylbenzene, conjugated butadiene, alpha-methylstyrene, vinyl toluene, vinyl naphthalene, and mixtures thereof.
14. (original) The method of claim 1, wherein the oxirane-functional vinyl addition polymer

is formed by reacting one or more oxirane-functional monomers with one or more hydroxy-functional monomers and with one or more other monomers.

15. (original) The method of claim 14, wherein the one or more oxirane-functional monomers is selected from the group consisting of glycidyl (meth)acrylate, mono- and di-glycidyl itaconate, mono- and di-glycidyl maleate, and mono- and di-glycidyl formate, and mixtures thereof; the one or more hydroxy-functional monomers is selected from the group consisting of hydroxyethyl (meth)acrylate, hydroxypropyl (meth)acrylate, and mixtures thereof; and the one or more other monomers is selected from the group consisting of styrene, halostyrene, isoprene, diallylphthalate, divinylbenzene, conjugated butadiene, alpha-methylstyrene, vinyl toluene, vinyl naphthalene, and mixtures thereof.

16. (original) The method of claim 1, wherein the oxirane-functional vinyl addition polymer comprises (by weight) 30 to 70 parts styrene; 3 to 10 parts glycidyl (meth)acrylate; and 30 to 70 parts hydroxyalkyl (meth)acrylate.

17. (original) The method of claim 1, wherein the acid-functional polymer is an acid-functional vinyl addition polymer and comprises homopolymers or copolymers prepared from ethylenically unsaturated acid or anhydride monomers and other optional monomers.

18. (original) The method of claim 17, wherein the acid-functional vinyl addition polymer has a number average molecular weight of 2,000 to 15,000.

19. (original) The method of claim 17, wherein the acid-functional vinyl addition polymer comprises 5 to 20 parts (by weight) styrene, 30 to 70 parts alkyl (meth)acrylate, and 30 to 70 parts acidic-functional monomer.

20. (original) The method of claim 1, wherein the tertiary amine is selected from the group:  $R^{14}R^{15}R^{16}N$ , wherein  $R^{14}$ ,  $R^{15}$  and  $R^{16}$  are substituted or unsubstituted monovalent alkyl groups containing one to eight carbon atoms in the alkyl portion.
21. (original) The method of claim 1, wherein the tertiary amine is selected from the group consisting of: trimethyl amine, dimethyl ethanol amine, methyl diethanol amine, ethyl methyl ethanol amine, dimethyl ethyl amine, dimethyl propyl amine, dimethyl 3-hydroxy-1-propyl amine, dimethylbenzyl amine, dimethyl 2-hydroxy-1-propyl amine, diethyl methyl amine, dimethyl 1-hydroxy-2-propyl amine, and mixtures thereof.
22. (original) The method of claim 1, wherein the water-dispersible polymer comprises at least 0.8 equivalent of tertiary amine per equivalent of oxirane group.
23. (original) The method of claim 1, wherein the water-dispersible polymer is provided in a coating composition comprising a crosslinking resin.
24. (original) The method of claim 1, further comprising adding a nonreactive filler polymer before or after dispersing the water-dispersible polymer in the carrier.
25. (original) The method of claim 24, wherein the nonreactive filler polymer is added before, during, or after reacting the oxirane-functional vinyl addition polymer and the acid-functional vinyl addition polymer together in the presence of a tertiary amine.
26. (original) The method of claim 1, further comprising adding a reactive polymer or monomers before or after dispersing the water-dispersible polymer in the carrier.
27. (original) The method of claim 26, wherein the reactive polymer or monomers are added

before, during, or after reacting the oxirane-functional vinyl addition polymer and the acid-functional vinyl addition polymer together in the presence of a tertiary amine.

28-35. (cancelled)

36. (original) A method, comprising:

providing an oxirane-functional vinyl addition polymer having an oxirane functionality of 0.5 to 5;

providing an acid-functional polymer having an acid number of 30 to 500;

providing a tertiary amine;

combining the acid-functional polymer with the tertiary amine to form a mixture and at least partially neutralize the acid-functional polymer;

combining the oxirane-functional vinyl addition polymer and the mixture to form a water-dispersible polymer; and

dispersing the water-dispersible polymer in a carrier comprising water.

37. (original) The method of claim 36, wherein the mixture is added over a period of time to the oxirane-functional vinyl addition polymer.

38-39. (cancelled)

40. (currently amended) A method, comprising:

providing an oxirane-functional vinyl addition polymer having an oxirane ~~functionality~~ functionality of 0.5 to 5 and a number average molecular weight of 2,500 to 20,000;

wherein the oxirane-functional vinyl polymer is the reaction product of 1 to 10 wt. % oxirane-functional monomer, 0 to 60 wt. % hydroxy-functional monomer, and the balance other monomer;

providing an acid-functional polymer having an acid number of 30 to 500 and a number average molecular weight of 2,000 to 15,000; wherein the acid-functional polymer is a vinyl polymer formed as the reaction product of at least 15 wt.% acid-functional monomer and the balance other monomer;

reacting the ~~oxirane-functional~~ oxirane-functional vinyl addition polymer and the acid-functional polymer together in the presence of a tertiary amine to form a water-dispersible polymer; and

dispersing the water-dispersible polymer in a carrier comprising water;

wherein the weight ration of the oxirane-functional vinyl addition polymer to acid-functional polymer is 90:10 to 50:50 and the ratio of amine:oxirane groups is 0.8:1 to 5:1.



**REMARKS**

In the Office action mailed on June 30, 2006, claims 1-8, 10-27, 36, 37 and 40 were rejected and claims 1- 40 were subjected to both restriction and election requirements under 35 U.S.C. 121.

**Restriction Under 35 U.S.C. 121**

At page 2 of the Office Action, claims 1-40 were restricted under 35 U.S.C. 121 into the following groups:

- I. Claims 1-8, 10-27, 36, 37, and 40 drawn to a method for preparing a dispersed water-dispersible polymer from an oxirane polymer and an acid polymer;
- II. Claims 28-34 drawn to a coating composition comprising a quaternary ammonium salt, a process of using and coated article prepared therefrom;
- III. Claim 35 drawn to an article comprising a cured film;
- IV. Claims 38 and 39 drawn to a method of preparing a dispersed water-dispersible polymer from sets of monomers, wherein one set is polymerized in the presence of the other.

During a telephone conversation with the Examiner on April 4, 2006, Applicants provisionally elected Group I claims 1-8, 10-27, 36, 37, and 40 with traverse. Applicants affirm this election and cancel claims 28-35, 38 and 39.

Page 3 of the Office Action asserts that the application contains claims directed to the following patentably distinct species:

- a. wherein the oxirane polymer is prepared by polymerizing oxirane functional monomers (claims 5-8, 12-16 and 40), and
- b. wherein the oxirane polymer is prepared by functionalizing a polymer with an oxirane functionalizing compound (claim 9).

The Office Action asserts that Applicants are required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable.

Applicants elect species (a) of claims 5-8, 12-16, and 40 with traverse. Applicants respectfully submit that search and examination of the above methods of preparing the oxirane polymer can be made without undue burden. In particular, Applicants submit that a search of both of the above identified methods (a) and (b) could be made in a manner likely to result in finding art pertinent to both methods, if any art pertinent to method (a) and/or (b) in fact exists.

Claim 1 is acknowledged in the Office Action as being generic. Applicants note that upon allowance of a generic claim such as claim 1, Applicants will be entitled to consideration of claims to additional species that depend from the allowed generic claim.

#### **Amendments to the Claims**

With this Amendment, the non-elected claims 28-35, 38 and 39 are cancelled without prejudice or disclaimer and Applicants reserve the right to file a divisional application directed to the subject matter of these claims at a later date.

Independent claim 40 is amended to correct a pair of spelling errors.

#### **35 U.S.C. 102 Rejections**

The present invention provides a method for forming a dispersion useful in coating applications that include a water-dispersible polymer. The water-dispersible polymer is formed by reacting an acid-functional polymer and an oxirane-functional vinyl addition polymer in the presence of a tertiary amine. In a preferred embodiment, the aforementioned polymers are reacted in the presence of the tertiary amine to form at least some quaternary ammonium salt. The resulting water-dispersible polymer is dispersed in a carrier comprising water to form a dispersion. None of the cited references disclose such a method for forming a dispersion.

I.     **Chu et al.**

Claims 1-6, 10, 11, 14, 17, 18, 20-27, 36 and 37 stand rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Pat. No. 4,446,258 (hereinafter "Chu et al."). Applicants respectfully traverse this rejection. Contrary to the assertions of the Office Action, Chu et al. does not disclose using an oxirane-functional vinyl addition polymer to form a water-dispersible polymer. Instead, Chu et al. teaches reacting a polymer containing carboxyl groups with a *non-vinyl condensation* polymer. Specifically, Chu et al. teaches using an epoxy resin formed from a condensation reaction of a bisphenol, such as Bisphenol A, and epichlorohydrin. (See col. 3, lines 24-31). As such, the epoxy resin of Chu et al. is formed through a condensation reaction and not an addition reaction, and thus *does not* constitute an oxirane-functional vinyl addition polymer.

Chu et al. does not disclose each and every element of claim 1 and, therefore, does not constitute an anticipatory reference. Applicants respectfully submit that the rejection of independent claim 1, and claims 2-6, 10, 11, 14, 17, 18, and 20-27 which depend therefrom, should accordingly be withdrawn.

Similarly, claims 36 and 37 are likewise not anticipated by Chu et al. Independent claim 36 recites forming a water-dispersible polymer using an oxirane-functional vinyl addition polymer. As discussed above, Chu et al. does not disclose using an oxirane-functional vinyl addition polymer to form such a water-dispersible polymer. Applicants respectfully submit that the rejection of claims 36 and 37 should be withdrawn.

## **II. Hart et al.**

Claims 1-8, 10, 12-15, 17, 19-21, 23-27, 36 and 37 stand rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Pat. No. 5,344,858 (hereinafter "Hart et al."). Applicants respectfully traverse this rejection. Contrary to the assertions of the Office Action, Hart et al. does not disclose reacting an acid-functional polymer and an oxirane-functional vinyl addition polymer in the presence of a tertiary amine to form a water-dispersible polymer that is subsequently dispersed in a carrier. Rather, Hart et al. teaches blending together a pre-dispersed

phosphated epoxy resin and a pre-dispersed acid-functional resin to form a two-component, unreacted blend of the two resins.

Moreover, Hart et al. teaches pre-forming the phosphated epoxy resin of the blend through reaction of a polyepoxide resin and a phosphoric acid. Such reactions of polyepoxides and phosphoric acid are known in the art to convert the oxirane groups of polyepoxide resins into phosphate groups. Further, in this regard, Hart et al. teaches stoichiometries and reaction conditions that follow methods known in the art for preparing phosphated epoxy resins whereby all of the oxirane groups are consumed. (See, e.g., col. 3 lines 44-50 and col. 8 lines 28-33. Thus, even if the two resins of the Hart et al. blend were to react with one another, the oxirane groups of the phosphated polyepoxide resin would be consumed *before* blending with the acid functional resin.

Hart et al. does not disclose each and every feature of claim 1 and does not constitute an anticipatory reference. Applicants respectfully submit that the rejection of independent claim 1, and claims 2-8, 10, 12-15, 17, 19-21, 23-27 which depend therefrom, should accordingly be withdrawn.

For reasons similar to those described above, claims 36 and 37 are likewise not anticipated by Hart et al. In particular, Hart et al. does not disclose the step of forming a water-dispersible polymer through combining an oxirane-functional vinyl addition polymer and a mixture including an acid-functional polymer and a tertiary amine as recited in claim 36. Applicants respectfully submit that the rejection of claims 36 and 37 as being anticipated by Hart et al. should accordingly be withdrawn.

### **III. Wilfinger et al.**

Claims 1-8, 10, 12-17, 19-21, and 23-27 stand rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Pat. No. 5,811,484 (hereinafter "Wilfinger et al."). Applicants respectfully traverse this rejection. Contrary to the assertions of the Office Action, Wilfinger et al. does not disclose reacting an acid-functional polymer and an oxirane-functional vinyl addition polymer *in the presence of* a tertiary amine as recited in claim 1. Instead, Wilfinger et al.

discloses reacting a polycarboxylic component and an epoxide-group-containing polyhydric component in the *absence* of a tertiary amine. The reacted compound may be later at least partially neutralized through the addition of a base. (See col. 2, lines 60-67). There is no disclosure in Wilfinger et. al. that teaches including a tertiary amine in the reaction mixture of the polycarboxylic component and the epoxide-group-containing component.

The instantly claims method is different and provides an entirely different water-dispersible polymer. Applicants respectfully submit that the rejection of independent claim 1, and claims 2-8, 10, 12-17, 19-21, and 23-27 which depend therefrom, should accordingly be withdrawn. Reconsideration and notice to this effect is respectfully requested.

### **35 U.S.C. 103(a) Rejections**

The following claims stand rejected under 35 U.S.C. 103 (a) as being unpatentable:

1. Claim 19 over Chu et al.;
2. Claims 11, 16, 18, and 22 over Hart et al.; and
3. Claims 11, 18, 22, and 40 over Wilfinger et al.

As discussed above with regards to the 102(b) rejections, independent claim 1 is in condition for allowance. Applicants respectfully submit that the 103(a) rejections of dependent claims 11, 16, 18, 19, and 22 are moot.

With regards to independent claim 40, which stands rejected under 35 U.S.C. 103(a) as being unpatentable over Wilfinger et al., Applicants again respectfully submit that Wilfinger et al. does not disclose reacting an oxirane-functional vinyl addition polymer and an acid-functional polymer together in the *presence* of a tertiary amine to form a water-dispersible polymer as recited in claim 40. As such, Applicants respectfully submit that the rejection of claim 40 under 35 U.S.C. 103(a) should be withdrawn.

**CONCLUSION**

In view of the foregoing, claims 1-27, 36, 37, and 40 stand in condition for allowance. A notice to that effect is respectfully requested. The Commissioner is authorized to charge any additional fees associates with this paper or credit any overpayment to Deposit Account No. 50-2070.

Respectfully submitted,

VALSPAR SOURCING, INC.

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By:   
Andrew A. DeMaster, Reg. No. 57326  
1101 South Third Street  
Minneapolis, MN 55415  
Telephone: (612) 851-7281  
Fax: (612) 375-7313